

DESCRIPTIONS AND REDESCRIPTIONS OF LANDSNAILS (MOLLUSCA: PUNCTIDAE) IN THE GENERA *PHRIXGNATHUS* AND *TAGUAHELIX*

F.M. CLIMO* AND J.F. GOULSTONE**

* MUSEUM OF NEW ZEALAND

** AUCKLAND

Abstract. Types of *Phrixgnathus francesci* Webster, 1904 and *Phrixgnathus elaiodes* Webster, 1904 contain more than one species in each case and lectotypes are here selected in line with the author's original description. Both species are transferred to the genus *Taguahelix* Powell, 1955. Two new species, *Phrixgnathus douglasi* and *Taguahelix crispata*, are described. These snails have been confused in the past with the Webster species. *Phrixgnathus brunneus* is also described, a species which A.E. Brookes intended naming about 1930, having selected prospective types from the Bay of Plenty.

This paper finishes work started by two early collectors. The Rev. W.H. Webster described several species of small landsnails and A.E. Brookes intended to describe new species for his tubes of "types" with names have been found in the Auckland Museum collections.

Most of Webster's type material contained many specimens without a holotype being nominated. In this paper we reconsider the type series of *Phrixgnathus francesci* Webster, 1904 and *Phrixgnathus elaiodes* Webster, 1904. The descriptions, however, which Webster gave did not wholly satisfy the characteristics of any one snail in the material offered. In 1987 F.M. Climo tentatively selected lectotypes and paralectotypes for the two species which offered the closest fit to the author's description but never published this information. Since then the Auckland Museum landsnail collection has been reviewed and re-housed by J.F. Goulstone and nothing has come to light in the Webster lots to contradict Climo's choices of lectotype. It seems appropriate now to redescribe the two Webster species and also two others which have previously been confused with them, and which indeed may have confused Webster himself.

The other snail here described, *Phrixgnathus brunneus*, comes from the collections of the late A.E. Brookes which are held in the Auckland Museum and include about 80 specimens from the Motu River, Bay of Plenty. Other specimens have also emerged from Brookes' bulk location lots which he had not separated. Again, it seems a fitting time to finalise an action he failed to complete about 1930.

We have used *Taguahelix* Powell, 1955 at a generic level to contain three of these species because they seemed to fall naturally within the genus typified by *Taguahelix campbellicus*

(Filhol). Powell (1955) included certain shells with hair-like processes from the sub-antarctic islands within the genus but we feel they would be better placed elsewhere. Climo (1992) discusses *Taguahelix* in a wider context and suggests better groupings for these other species. The remaining two we have left in *Phrixgnathus*, as a holding group until their proper affinities can be ascertained.

Distribution details have been included in the text for relevant specimens held in Auckland Museum and the Museum of New Zealand. Maps also show this information, though somewhat abridged.

The following names which occur frequently, particularly in the distribution sections, are referred to by initials only: A.E. Brookes, F.M. Climo, J.F. Goulstone, B.F. Hazelwood, P. Mayhill, D.J. Roscoe, W.H. Webster. Auckland Museum = AK. Museum of New Zealand = MNZ. Map references refer to the NZMS 260 series.

SYSTEMATICS

FAMILY: PUNCTIDAE Morse, 1864

GENUS: *TAGUAHELIX* Powell, 1955

TYPE SPECIES: *Thermia expeditionis* Suter, 1909 = *Helix campbellica* Filhol, 1880

Shells unicoloured, light horny, yellow or greenish, depressed helicoid or depressed turbinate with elaborate sculpture of numerous irregular axials or wrinkles, at times faint but often extended and crisp, on a surface pattern of dense microscopic spiral threads. Protoconch relatively large, low, rounded, sculptured with exceedingly fine dense spiral striations.

Taguahelix elaiodes (Webster, 1904) Figs. 1-4

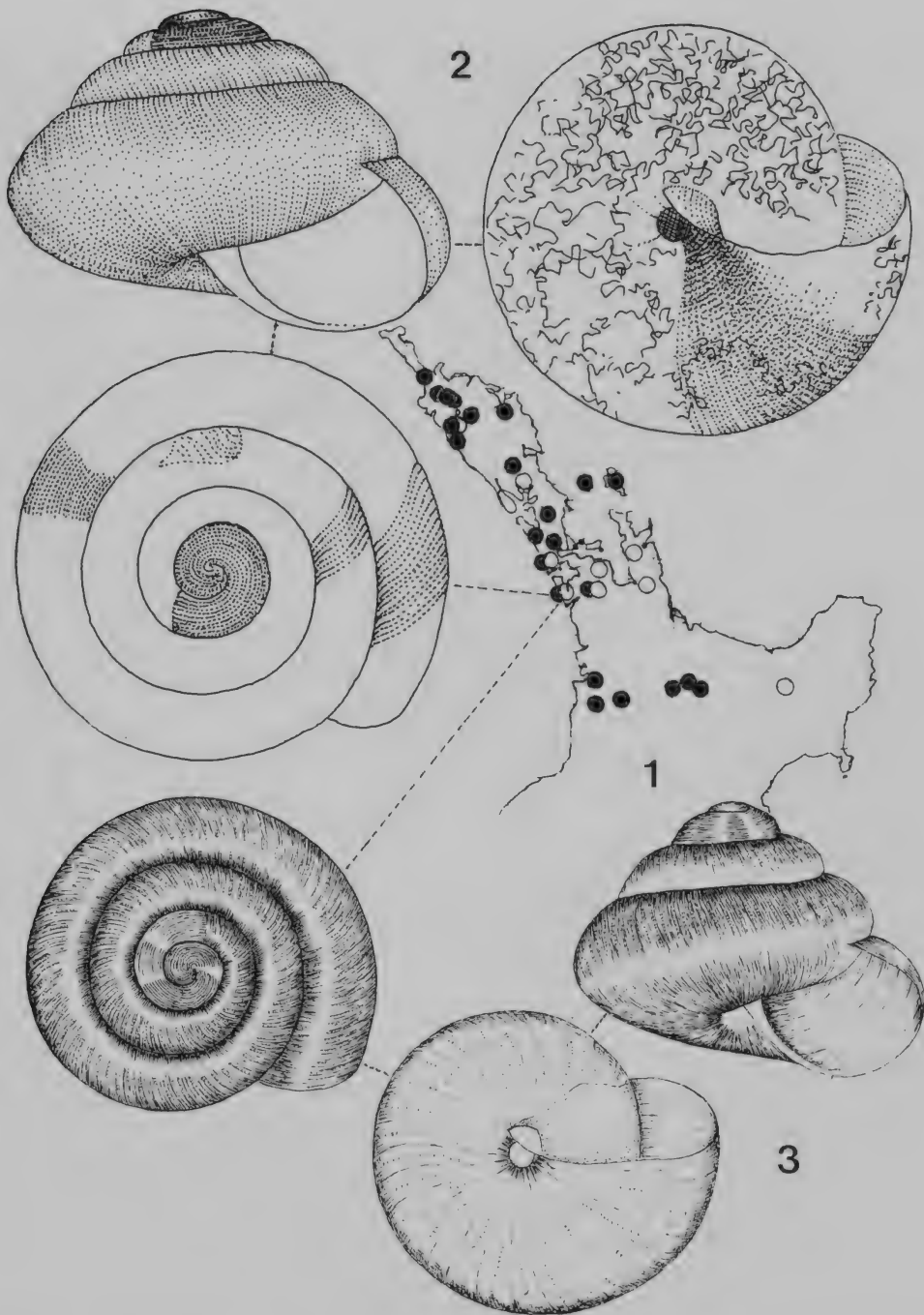
Synonymy: *Phrixgnathus elaiodes* Webster, 1904: 106 in part; Suter 1913: 744 in part (Suter used the wrong illustration). *Laoma* (*Phrixgnathus*) *elaiodes* Powell, 1979: 327. '*Paralaoma*' n.sp.33 Solem, Climo & Roscoe 1981: 479. Ballance 1982: 31. Punctid n.sp.33 Goulstone 1983: 45, 1990: 40. *Taguahelix* (n.subgen.1) *elaiodes* Climo 1992: 35.

DESCRIPTION

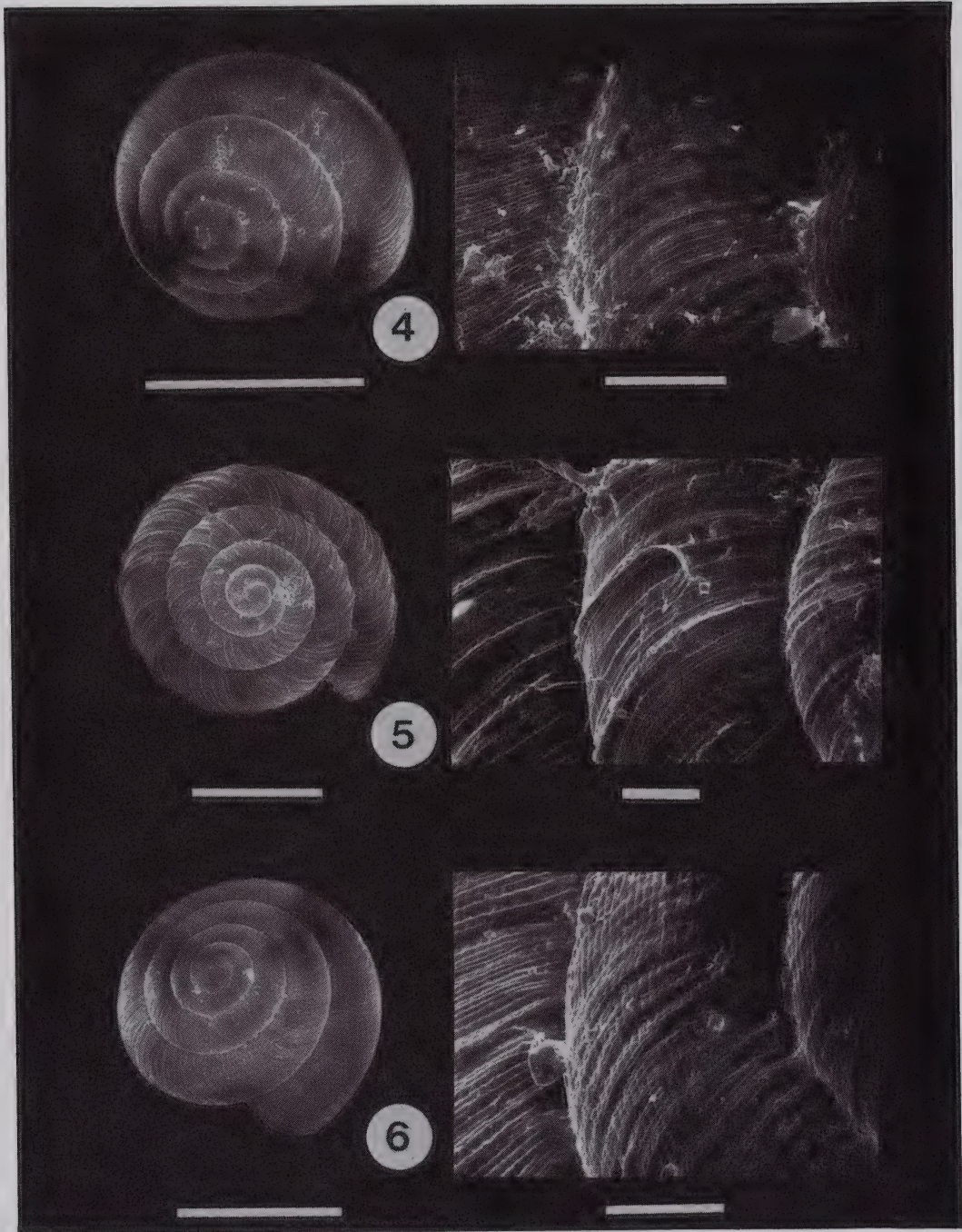
Shell small, turbinate, olive green, sub-perforate, finely concentrically striate, these striations also prominent on the succeeding whorls. The post embryonic whorls also have fine radial sculpture, very faint on the base. This sculpture in places on some shells shows a pattern of wider stronger primary ribs but seems to be random. However, all the ribbing is at a microscopic level and the shell even with 10x magnification appears nearly smooth. Protoconch 1.25 whorls. Total whorls 3.75; periphery and base rounded. Suture deep. Collumella oblique, reflexed to slightly cover the narrow umbilicus.

REMARKS

There were two tubes of types, one labelled "Types" the other "Co-types". The "Types" tube (T.M.384), examined by F.M. Climo in 1987, contained seven specimens comprising three specimens of *Taguahelix elaiodes* Webster (AK 70384, MNZ M115631); one specimen



Figs. 1-3. *Taguahelix elaiodes*. 1. Geographic distribution. Solid dots are records from the Museum of New Zealand; open dots are records from the Auckland Museum. 2. Waiuku, 1.5 mm x 1.2 mm (lectotype AK 70384). 3. Waiuku, 1.4 mm x 1.2 mm (paralectotype AK 71557).



Figs. 4-6. Scanning electron photomicrographs. 4. *Taguahelix elaiodes*, Waiuku (paralectotype AK 71582). 5. *Taguahelix crispata*, Titirangi, A.E.B. 11/30 (AK 79620). 6. *Taguahelix* n.sp., Scenic Drive, Waitakere Ranges, A.E.B. (AK 79621). Scale lines: left 1 mm, right 0.1 mm.

of Punctid n.sp.3 Climo ms. (AK 79434); one specimen of Punctid n.sp.29 Climo ms. (AK 79436); and two specimens of Punctid n.sp.32 Climo ms. (AK 79435).

The co-type tube found by J.F. Goulstone in 1992 contained five specimens comprising one paralectotype of *Taguahelix elaiodes* Webster (Fig. 4, AK 71582); two specimens of *Taguahelix viridula* (Suter, 1909) (AK 79510); and two specimens of Punctid n.sp.32 (AK 79435). Other material collected by Webster and labelled *P. elaiodes* contained in addition to the above, *Taguahelix crispata* n.sp.

Webster mentions ribs at 10 per mm in his type description and these are hard to find except the somewhat random occurrence mentioned in the description. It seems he was describing features on several species for, though *T. elaiodes* Webster is always a difficult shell to identify because of its lack of strong features, all the specimens we have seen have shown uniformity.

Also lacking strong features is Punctid n.sp.32 which is a similar size and shape but shinier, smoother and lighter coloured and this is the species most often found together with *T. elaiodes* in Webster's material. It could also be confused with a juvenile *Taguahelix crispata* n.sp., and particularly a similar new species discussed later (Figs. 6,9), though these are larger with stronger sculpture. The numbered Punctids are illustrated in Goulstone (1983, 1990).

TYPE LOCALITY: Waiuku

LECTOTYPE: Auckland Museum, AK 70384 (width 1.5 mm, height 1.2 mm).

PARALECTOTYPES (3): AK 71557, AK 71582, MNZ M115631. AK 70384, AK 71557 and MNZ M115631 are from the original "Type" tube (T.M.384) from Waiuku. AK 71582 is from the "Co-type" tube also from Waiuku.

HABITAT

Little known for the snail never seems common and few live ones are seen. Several specimens were found in rimu (*Dacrydium cupressinum*) litter.

DISTRIBUTION

Mangatete Reserve, P.M. 12/83, MNZ M82449. North Mangamuka Gorge, D.J.R. 30/12/78, MNZ M61905. Warrawarra South, Maungataniwha, O05/371436, P.M. 1/90, MNZ M101638. Tutamoe Walkway, P.M. 9/84, MNZ M31795. Waima Forest, Mountain Rd., O06/515345, J.F.G. 5/90, AK. Kaikohe, A.C. O'Connor, 1935, MNZ M25294. Waiotemarama State Forest, P.M. 11/86, MNZ M98253. Northern Waipoua Forest, N. Gardner, 9/68, MNZ M29531. Waipoua Forest, 5 km S of 'Tane Mahuta', B.F.H. 6/10/76, MNZ M55446. Mangatu State Forest, Tikehore Rd., B.F.H. 6/3/77, MNZ M55771. Pukeiti State Forest, Manginangina turnoff, P05/824686, D.J.R. 27/12/78, MNZ M104269. Punaruku, upper ridges in litter, R. Parrish, 15/10/87, MNZ M99078. Mt. Hirakimata summit, Great Barrier Island, F.M. O'Brien, 15/4/66, MNZ M57644. Little Barrier Island, A. Ballance, 8/81, MNZ M77449. Little Barrier Island: J. Cochrane, MNZ M79520; Tirikanawa, P.M. 8/83, MNZ M79402.

Waipu Caves Rd., limestone, B.F.H. 9/9/84, MNZ M80213. Omeru Reserve, B.F.H. & H. Taylor, 20/4/87, MNZ M99574. Woodcocks, Kawa Reserve, B.F.H. 28/9/83, MNZ M78872. Dome Valley, start of Waiwhiu Conical Pk. Rd., B.F.H. 8/9/84, MNZ M80253. Kaukapakapa Scenic Reserve, P.M. 9/85, MNZ M82939. Coromandel-Kuaotuna Rd., N. Douglas, 8/1/69, AK. Thames, Kauaeranga Valley, T12/459542, J.F.G. 1/79, AK. North Shore, Paremoremo, D.J.R. 26/12/77, MNZ M83501. Waitakere Ranges: Cornwallis, 20/5/27, AK; Titirangi, A.E.B. AK; Scenic Drive, Mrs. D. Hole, 20/6/74, AK; Fairy Falls, Q11/486754, J.F.G. 9/82, AK; Walkers Bush, R11/513770, J.F.G. 1/78, AK; Huia Dam Q11/484695, J.F.G. 11/11/90, AK; Walkers Bush, rimu litter, B.F.H. 26/9/83, MNZ M80417; Spraggs Bush, under logs, B.F.H. 26/9/83, MNZ M88285; Henderson, B.F.H. 26/9/83, MNZ M75871; Titirangi, J.F.G. 1982, MNZ M79594; Swanson, Pukematekeo summit, B.F.H. 26/9/83, MNZ M80363. Hunua Ranges: Wairoa Dam, S12/987528, J.F.G. 8/79, AK; Mangatawhiri, J.F.G. 1975, MNZ M54237. Manukau Peninsula: Wattle Bay, R11/512606, N. Douglas, 24/2/74, AK; Awhitu Gully, F.M.C. 15/2/81, MNZ M78479. Pukekohe, Roosevelt Park, R12/804429, J.F.G. 10/85, AK. Kawhia: Whenuapo, Bluff deposit, Hamilton Junior Naturalists Club, 1970-72, MNZ M45877; Te Kauri Park, Andersons Bluff, P. Parkinson, 11/68, MNZ M48094; Te Kauri Park, under log, B.F.H. 15/8/77, MNZ M69871. Waitomo: Waitomo System, Catacomb Cave, Hamilton Junior Naturalists Club 1970-72, MNZ M83502; S end Mahoe Rd., B.F.H. 13/11/77, MNZ M73292, & 11/9/84, MNZ M76406; Paryphanta Cave, Hamilton Junior Naturalists Club, 1970-72, MNZ M83496; cave entrance, F.M.C. 18/2/81, MNZ M77553; Piripiri, Bluff deposit, Natural Bridge, Hamilton Junior Naturalists Club, 1970-72, MNZ M83500. Tokoroa, Pukerimu Reserve, under logs, B.F.H. MNZ M68131. Mamaku, W18/644694, D.J.R. 13/12/72, MNZ M31795. Rotorua, C. Broomfield, 1978, MNZ M61575. Mt. Ngongotaha summit, B.F.H. 2/9/78, MNZ M58223. Ureweras, Waikare River, W17/620973, J.F.G. 5/79, AK.

Taguahelix crispata n. sp. Figs. 5, 7-8

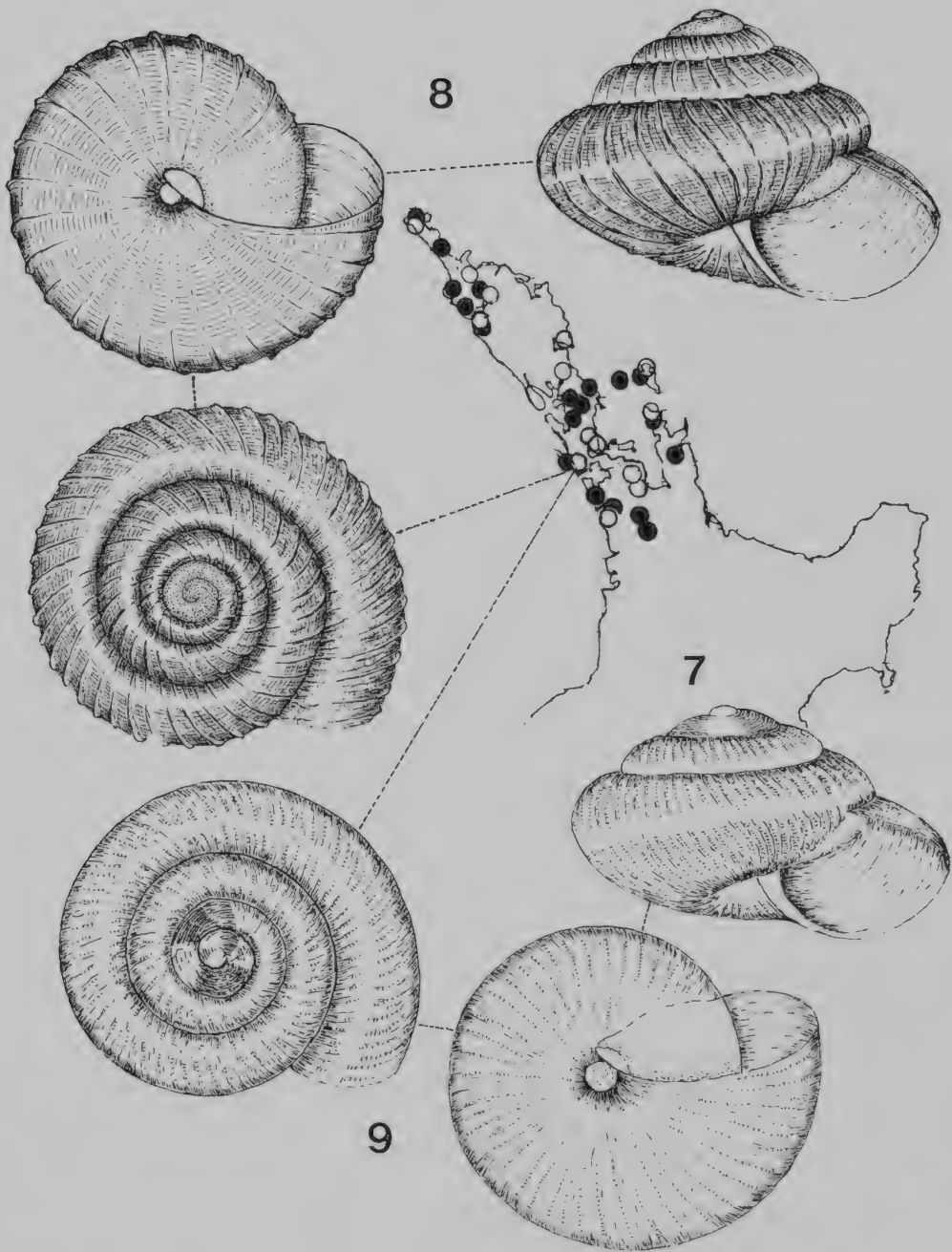
Synonymy: '*Phrixgnathus' elaiodes* Solem, Climo & Roscoe 1981: 478. Punctid n.sp.17 Goulstone 1983: 43, 1990: 40; Goulstone, Mayhill & Parrish 1993: 17. *Taguahelix* (s.s.) n.sp.1 Climo 1992: 23.

DESCRIPTION

Shell small, turbinate, slightly compressed with 4.25 whorls. Protoconch of 1.75 whorls with very faint spiral striations, though on the rest of the shell they are prominent. Post embryonic whorls with prominent, irregular radial periostracal processes, facing backwards, about 30-40 on the final whorl of an adult specimen, with similar finer ribbing in between. The main ribs are quite solid based and in some specimens produced into thin sharp blades. If these processes are worn off the shell appears with quite solid ridges. This strong ribbing extends a little onto the base then muted radial and spiral striae exhibit about equal prominence. Umbilicus is open though narrow and partly covered by the reflexed columella. Colour golden in fresh shells.

REMARKS

This snail has a handsome prominent shell, overlooked by earlier collectors, so that very



Figs. 7-9. *Taguahelix crispata* and *Taguahelix n.sp.* 7. Geographic distribution of *Taguahelix crispata*. Solid dots are records from the Museum of New Zealand; open dots are records from the Auckland Museum. 8. *Taguahelix crispata*, Titirangi, Waitakere Ranges, 2.5 mm x 1.9 mm (holotype AK 71558). 9. *Taguahelix n.sp.*, Piha Rd., Waitakere Ranges, 1.5 mm x 1 mm (AK 79622).

few specimens are present in the Auckland Museum collection. It is not plentiful in the Waitakeres.

There is one undescribed species which could be mistaken for *T. crispata* and though it needs further evaluation we have figured it here (Figs. 6,9). It has a more depressed shell and its ribbing is not so pronounced, more akin to that of *T. viridula*, though without the accelerated final whorl. The two species occurred together in the type location R11/581720, Titirangi.

TYPE LOCALITY: Titirangi, Waitakere Ranges, R11/581720.

HOLOTYPE: Auckland Museum, AK 71558 (width 2.5 mm, height 1.9 mm), Atkinson Reserve, Titirangi, under an old rimu, J.F.G. 4/92.

PARATYPES (4): AK 71559, Huia Dam, Waitakere Ranges, Q11/484695, J.F.G. 9/82. MNZ M11562 (3 specimens), Laingholm, Waitakere Ranges, R11/568691, J.F.G. 11/82.

HABITAT

This species prefers an aerial habitat and has been found on trunks under bark and in living nikau (*Rhopalostylis sapida*) boles as well as on the ground. A tree platform in the Waitakeres 10 m off the ground yielded a remarkable number of species including *T. crispata* (Goulstone 1992).

DISTRIBUTION

Te Pahi: Radar Bush, N02/891477, J.F.G. 11/5/91, AK & P.M. 5/82, MNZ M74347; Waterfall Gully B.F.H. 3/1/76, MNZ M48654; Unuwahao, P.M. 4/83, MNZ M79020; Waterfall Gully, D.J.R. 3/1/76, MNZ M115625 & 30/12/78, MNZ M83494; Hauptoto Bush, N02/068488, R. Parrish, 17/3/88, MNZ M96558; Unuwahao, N02/009519, C. Ogle et al. 9/86, MNZ M87895; Radar Bush, alluvial tce. by stream, C. Ogle et al. 11/86, MNZ M87860; Ngaruariki Stream N02/034531, C. Ogle et al. 11/86, MNZ M87806. Parengarenga: Head of Paingatai Channel, N02/063494, P. Anderson, S. Carlin & C. Ogle, 6/3/85, MNZ M77134 & Head of Waimanana Stm. N02/077455, 6/3/85, MNZ M83492. Ahipara: Hunahuna catchment P.M. 1/90, MNZ M101671 & Waitaha catchment, 11/87, MNZ M98796. 1.6 km S from Mangamuka turnoff towards Kohukohu, P.M. 10/78, MNZ M62524. Puketi State Forest, P.M. 9/84, MNZ M83139. Warrawarra State Forest: P.M. 10/78, MNZ M62551; South, Maungataniwha, O05/371436, P.M. 1/90, MNZ M101651; North, P.M. 10/86, MNZ M97243. Hokianga, Motukaraka Scenic Reserve, O05/525494, J.F.G. 5/90, AK. Hokianga, Opononi, W. LaRoche, AK. Motutoa midden, C. Fredericksen, 1989, MNZ M97506. Manganui: Pekerau, A.E.B. AK; Oruru, A.E.B. AK. Ngunguru, P.M. 9/78, MNZ M58123. Whangarei Heads, A.E.B. 25/11/51, AK. Waipu Gorge, Falls Track, B.F.H. 4/91, AK. Kaukapakapa Scenic Reserve, P.M. 9/85, MNZ M82934. Warkworth: Woodcocks Rd. P.M. 8/78, MNZ M63202; nikau litter behind Bob Penniket's house, R09/055290, B.F.H. 3/3/85, MNZ M76564; Kawa Reserve, B.F.H. 28/9/83, MNZ M78877; Kaipara Flats Rd., B.F.H. 29/9/83, MNZ M78799. Kaipara Hills Rd., Q09/412248, B.F.H. 2/1/87, MNZ M97552. Omeru Reserve, B.F.H. & H. Taylor, 20/4/87, MNZ M99585. Kaipara Harbour, Puatahi Marae, 0.2 km N of Elbow Ck., Q09/389284, B.F.H. 2/1/87, MNZ M97593. Omaha, near Leigh, B.F.H.

4/10/76, MNZ M72426. Leigh, Frosts Rd., B.F.H. 28/9/83, MNZ M82376. Little Barrier Is., A. Ballance, 8/81, NZ M77448. Great Barrier Island: Port Fizroy, A.E.B., AK; Northern Block, S08/269634, J.F.G. 24/3/90, AK; Motairehe, R.G. Ordish, 23/11/63, MNZ M25513 & 20/11/64, MNZ M28921; McLauglins Bush, T08 /320540, P. Anderson, 1988, MNZ M97293. Coromandel Peninsula: Port Charles - Colville Rd., N. Douglas, 8/1/69, AK; Port Jackson, S10/221195, J.F.G. 1/78, AK. 750 m SW of Colville Motel, T10/306044, D.J.R. 4/9/88, MNZ M101147. Waiwera, Puhoi Hill, A.W.B. Powell, 5/4/47, AK. North Shore: Orewa, C.R. Laws, AK; Kauri Gully, 6/6/26, AK. Tiritiri Matangi Island, P.M. 9/83, MNZ M82487. Waitakere Ranges: Titirangi Filter Station, R11/567726, J.F.G. 4/78, AK; Titirangi, B.F.H. 26/9/83, MNZ M78897; Huia, Q11/475696, J.F.G. 11/82, AK; Walkers Bush, B.F.H. 26/9/83, MNZ M75322; Muriwai, M.E. Fairburn, 27/10/26, AK. Hunua Ranges: Workman Track, S12/105548, J.F.G. 15/9/85, AK; Waharau Regional Park, S12/130600, J.F.G. 1/1/78, AK. Waiuku: W.H.W. AK; Waipipi Scenic Reserve, B.F.H. 3/1/77, MNZ M57668 & F.M.C. 11/2/81, MNZ M83490. Tairua, Charlottes Farm, P.M. 9/85, MNZ M76250. Glen Murray, R. Mannering, 2/6/72, MNZ M88515. Waikaretu, Mannering Farm, S. Mannering, 1972, MNZ M61584 & B.F.H. 17/9/77, MNZ M58255. Huntly, Waikawa Council Reserve, C.H. Broomfield, 1979, MNZ M72 251. Raglan, Te Toto Gorge, R14/666717, J.F.G. 3/84, AK.

Taguahelix francesci (Webster, 1904) Figs. 10-13

Synonymy: *Phrixgnathus francesci* Webster, 1904: 106 in part; Suter 1913: 745 in part. *Laoma* (*Phrixgnathus*) *francesci* Powell, 1979: 327 in part. '*Paralaoma*' n.sp.aff.33 Solem, Climo & Roscoe 1981: 479. Ballance 1982: 31. Punctid n.sp.7 Goulstone 1983: 42; 1990: 39. *Taguahelix* (n.subgen.1) *francesci* Climo 1992: 26, Fig.6a.

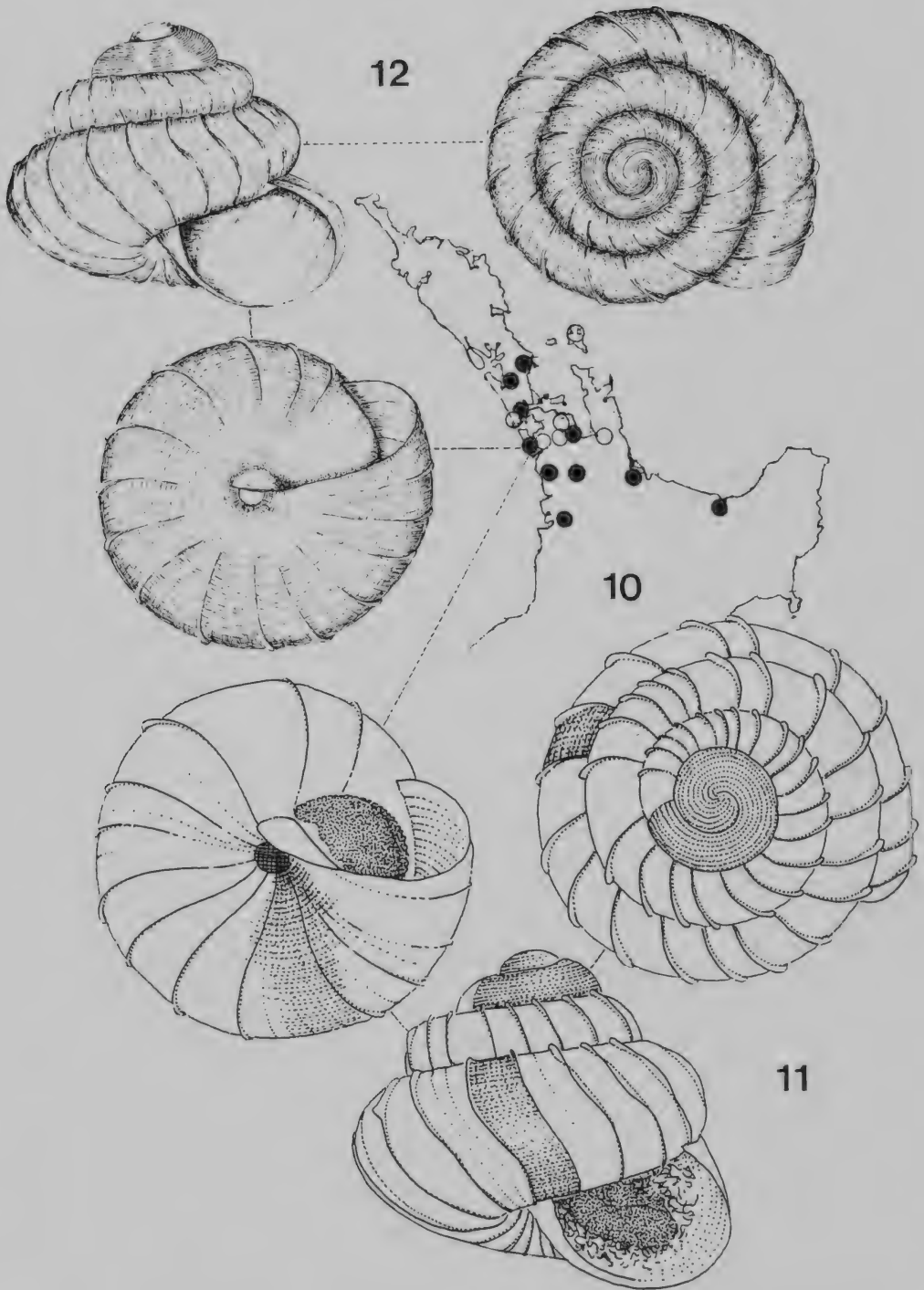
DESCRIPTION

Shell turbinate, 4.25 whorls, dark brown with the epidermis dull. Protoconch 1.75 whorls with about 15 strong spiral lirae. These lirae cover the whole shell somewhat muted on the following whorls but strong again on the base. Prominent radial periostracal processes, 5-6 per mm (c. 20 on the final whorl of an adult specimen), directed backwards, cover the post embryonic whorls and descend slightly onto the base. On a well preserved shell these can be quite tall and plate-like. Between these processes, in places, very fine hair-like ribs can be seen, but mostly these are rubbed off and irregular growth ridges are left. Periphery and base rounded, suture deep. Columella oblique, reflexed, slightly covering a narrow umbilicus.

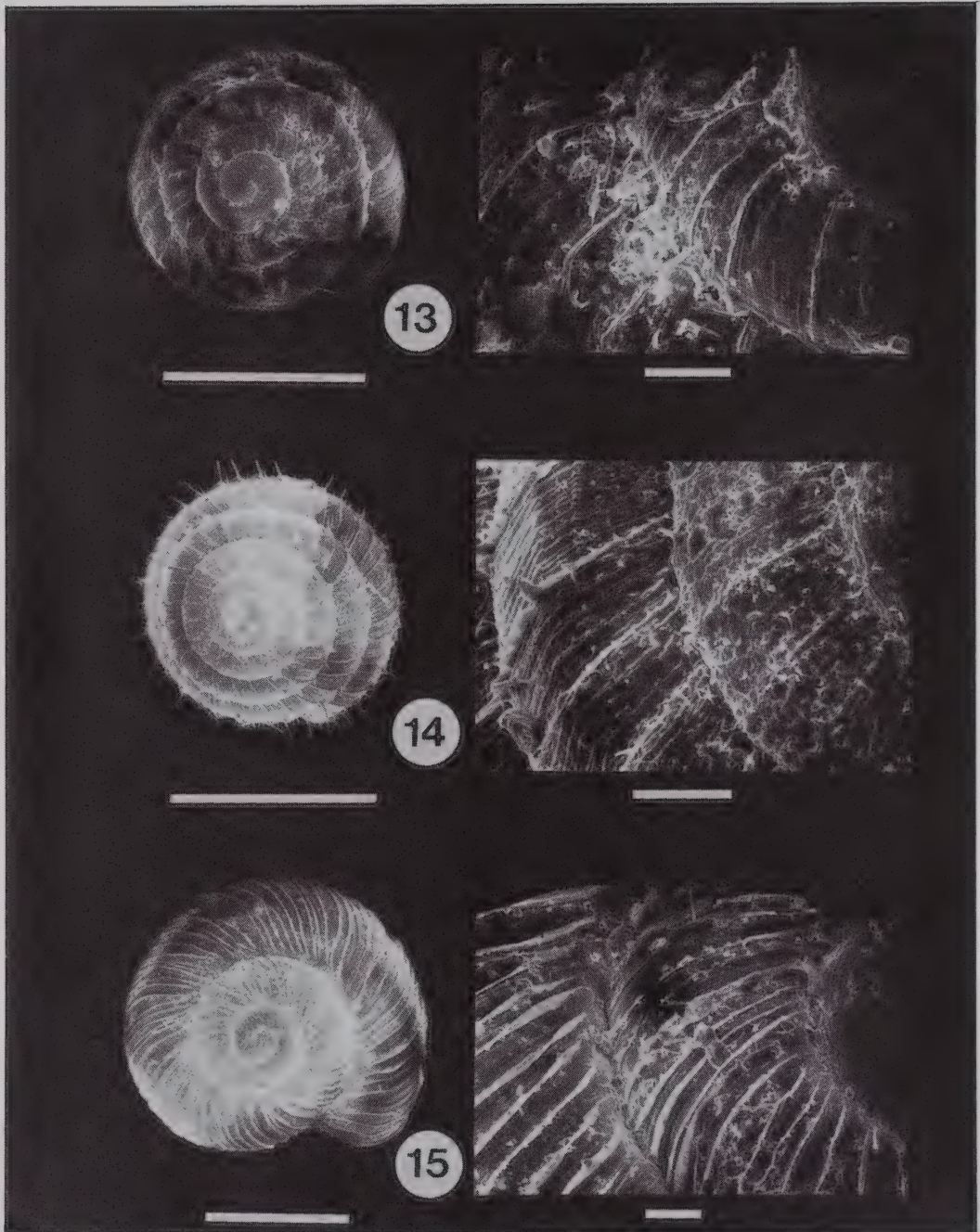
REMARKS

The types of *Taguahelix francesci* in the Auckland Museum collection examined by F.M. Climo in 1987 contained two species. There were six specimens of *Taguahelix francesci* Webster and 11 specimens of *Phrixgnathus douglasi* (AK 79437) though two of the latter were just pieces. Climo chose a lectotype and five paralectotypes from the ones which were closest to the original description.

Webster described the secondary ribbing of *T. francesci* as hairlike and some authors have taken this to mean that the shell had hairs, which is a feature of *Phrixgnathus douglasi*. However, the shells of *P. douglasi* in the type series had lost their hairs and this made the two species somewhat similar. For a few years before 1987 the hairy shell was recognised as *T.*



Figs. 10-12. *Taguahelix francesci*. 10. Geographic distribution. Solid dots are records from the Museum of New Zealand; open dots are records from the Auckland Museum. 11. Waiuku, 1.4 mm x 1.4 mm (lectotype AK 70385). 12. Waiuku, 1.4 mm x 1.4 mm (paralectotype AK 71556).



Figs. 13-15. Scanning electron photomicrographs. 13. *Taguahelix francesci*, Waiuku (paralectotype AK 71583). 14. *Phrixgnathus douglasi*, Little Barrier Island, A.E.B. (AK 79619). 15. *Phrixgnathus brunneus*, Motu River, A.E.B. (paratype AK 71584). Scale lines: left 1 mm, right 0.1 mm.

francesci but this was clearly wrong. Earlier collectors had not had this perception (see Discussion). Although only one Webster specimen in the Auckland Museum had one or two epidermal hairs (Fig. 21), it seems unlikely that Webster would have missed this feature if indeed this was the species he was describing.

There are two other small undescribed shells in the Auckland area (Punctid cf. n.sp.7 and Punctid n.sp.69 drawn in Goulstone 1990) which could be mistaken for *T. francesci* but the latter's brown colour when fresh should always separate it from these.

TYPE LOCALITY: Waiuku.

LECTOTYPE: Auckland Museum, AK 70385 (width 1.4 mm, height 1.4 mm).

PARALECTOTYPES (5): AK 71556 (two specimens), AK 71583, MNZ M115629 (two specimens). All these types are from Webster's type series .

HABITAT

A South Auckland survey (Goulstone 1990) showed that this species preferred more disturbed bush remnants or edges of bush and was not present in the deeper podocarp litter. It appears to be a ground dweller.

DISTRIBUTION

Great Barrier Island, Northern Block, S08/269634, J.F.G. 24/3/90, AK. Omaha Golf course, near Leigh, B.F.H. 4/10/76, MNZ M54273 . Warkworth, Beverley Price Track, Moirs Hill Walkway, B.F.H. 4/2/87, MNZ M97677; Kawa Reserve, Woodcocks, B.F.H. 28/9/83, MNZ M78873. Waitakere Ranges: Huia Dam, Q11/484695, J.F.G. 11/82, AK; Piha, Q11/427710, J.F.G. 3/82, AK; Fairy Falls, Q11/488758, J.F.G. 9/82, AK; Titirangi, R11/581720, J.F.G. 8/82, AK; coast west of Blockhouse Bay, B.F.H. 17/8/86, MNZ M97695. Auckland, Howick, A.W.B. Powell, 4/6/27, AK. Papakura: Ponga Rd. Reserve, R12/885534, J.F.G. 13/6/87, AK; Ardmore Quarry Rd., R12/898594, J.F.G. 11/9/88, AK. Hunua Ranges: Waharau Regional Park, S12/125601, J.F.G. 10/83, AK; Cosseys Dam, S12/974568, J.F.G. 3/83, AK; Mangatawhiri, J.F.G. 1975, MNZ M54235; Moumoukai Hill Rd. - Waharau Track, S11/623013, J.F.G. 2/11/86, AK. Bombay: Mt. William Reserve, S12/904409, J.F.G. 5/84, AK; Ravenhorpe Scenic Reserve, R12/848466, J.F.G. 10/88, AK. Waiuku: Waipipi Scenic Reserve, broadleaf (*Griselinia littoralis*) & mamaku (*Cyathea medullaris*) litter, F.M.C. & D.J.R. 11,12/2/81, MNZ M78563. Webster Coll. ex A.C. O'Connor Coll., MNZ M88274. Waikato Heads Colebaker Reserve, P.M. 6/83, MNZ M87484. South Hapuakohe Range, Te Hoe, Mangatea Rd., *Astelia* litter, B.F.H. 7/10/78, MN Z M63508. Thames, Kaitarakihi Track, P.M. 1/84, MNZ M99307. Waitomo Village, 2.5 km E of shop, B.F.H. 13/11/77, MNZ M68481. Tauranga, Matakana Island, D.J.R. 16/4/79, MNZ M83479. Near Ohope, Kutarere, W15/739425, D.J.R. 10/7/78, MNZ M104563. Also recorded from Little Barrier, A. Ballance, 1982.

***Phrixgnathus douglasi* n. sp. Figs. 14, 16-22**

Synonymy: *Phrixgnathus francesci* Webster, 1904: 106 in part; Suter 1913: 745 in part; Goulstone 1983: 36. Powell 1979: 327 in part. '*Paralaoma*' *francesci* Solem, Climo & Roscoe, 1981: 479.

DESCRIPTION

Shell small, turbinate of four whorls and sometimes five. Protoconch of 1.5 whorls faintly spirally striate, the striations continuing over the whole shell. The post embryonic whorls have thin radial periostracal processes rather distant, about 16-40 on the body whorl, which culminate in two rows of spiky hairs on each whorl. Some of these hairs are doubled and sometimes trebled (Fig. 18) in a staghorn effect, particularly on the last whorl. The space between this ribbing contains weak irregular growth lines rather overshadowed by the spirals. There are short, bristle like hairs on the base at each joint of a spiral and radial rib, sometimes the first two rows around the perimeter being closer together. The umbilicus is narrow and often partly covered by a reflexed columella.

REMARKS

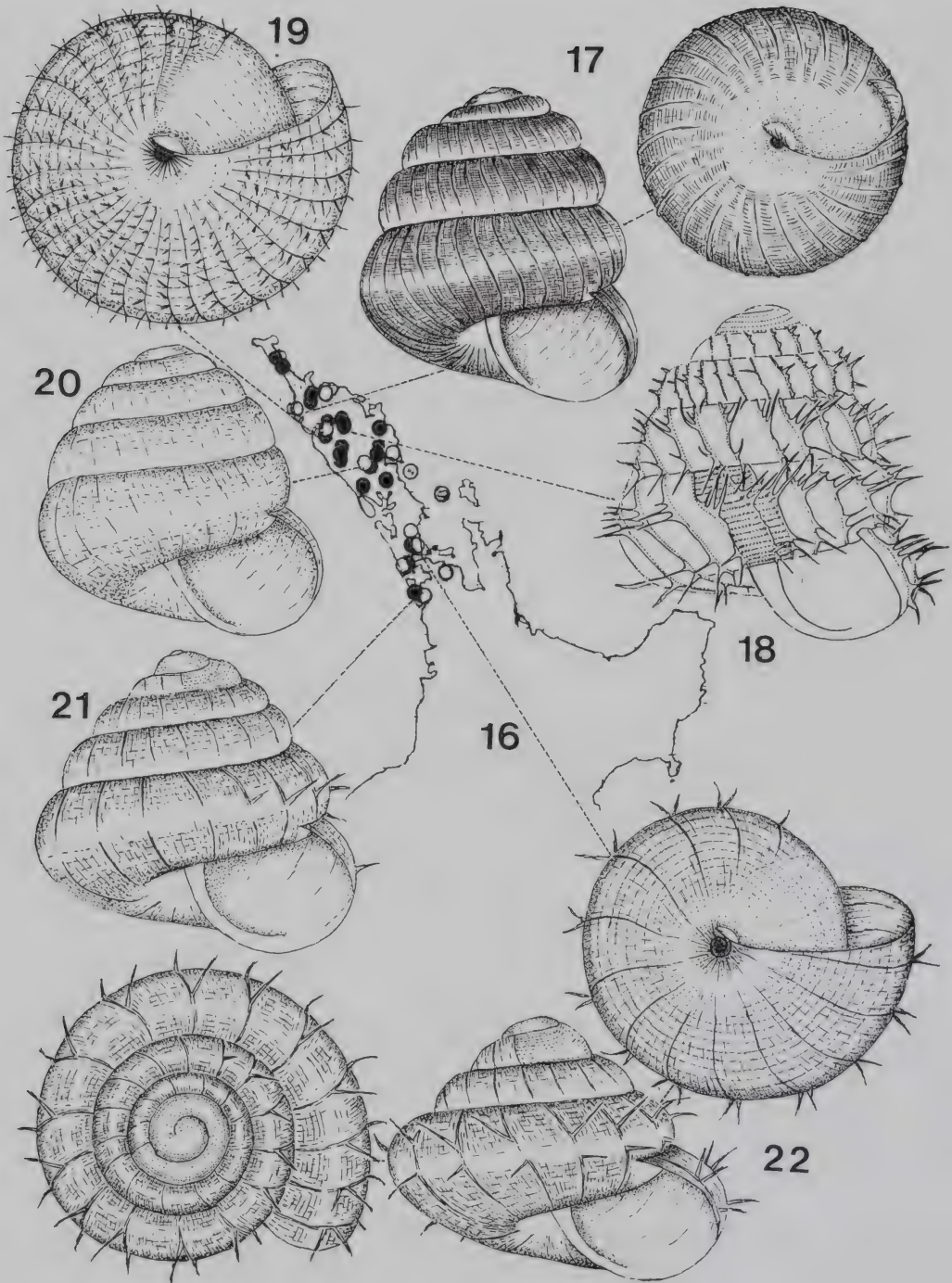
The shell of this snail changes with age. A full-grown adult will have five whorls and dimensions of 1.5 mm x 1.5 mm but a specimen of only four whorls will measure 1.3 mm x 1.0 mm. At the start of the Okura Walkway, North Shore, where they are reasonably common in damp, taraire-puriri (*Beilschmiedia tarairi*, *Vitex lucens*) forest they never seem to grow beyond four whorls. The same is true at Piha, Waitakere Ranges, in damp nikau (*Rhopalostylis sapida*) litter. Also in these two locations the rib count is low, only about 16 on the last whorl. Other rib counts on final whorls are: Little Barrier Island - 36 on a five-whorl specimen, 26 on a four-whorl specimen. Hen & Chickens Islands - 26 on a 3.5-whorl specimen. Mt. Huarua - 24 on a 4.5-whorl specimen, 22 on a four-whorl specimen. Kaingaroa - 36 on a five-whorl specimen, 40 on a five-whorl specimen.

One site at Okaihau had shells with elaborate epidermal processes not seen elsewhere (Fig. 18) and the base hairs of all the multi-ribbed shells seem to be more profuse and better developed (Fig. 19).

Samples from Mt. Huarua and north contain specimens that are globular (Fig. 20) and at the Herekino Gorge all the adult shells are taller and narrower (Fig. 17). Here also few had processes or hairs.

On Little Barrier Island shells had an interstitial sculpture of many sharp radial riblets, and indistinct spiral ridges (Fig. 14), which was at variance with all the mainland material. However, we have seen only specimens collected by A.E. Brookes many years ago.

TYPE LOCALITY: Okura River, North Shore, R10/631018. Remnant of puriri-taraire forest at start of Okura Walkway.



Figs. 16-22. *Phrixgnathus douglasi*. 16. Geographic distribution. Solid dots are records from the Museum of New Zealand; open dots are records from the Auckland Museum. 17. Herekino Gorge, 1.2 mm x 1.4 mm (AK 79614). 18. Forest Rd., Okaihau, 1.5 mm x 1.8 mm (MNZ M47325). 19. Waima Forest, 1.4 mm (AK 79615). 20. Tangihua Range, 1.1 mm x 1.2 mm (AK 79617). 21. Waiuku, 1.5 mm x 1.5 mm (AK 79618). 22. Okura River, 1.3 mm x 1.0 mm (holotype AK 71560).

HOLOTYPE: Auckland Museum, AK 71560 (width 1.3 mm, height 1.0 mm). Okura River, J.F. Goulstone, 4/2/93.

PARATYPES (12): AK 71561 (6 specimens), Okura River, J.F.G. 4/2/93. MNZ M115627 (6 specimens), Okura River, J.F.G. 15/9/91.

HABITAT

Litter, especially fairly damp litter. Undisturbed bush, though B. Hazelwood (pers. comm.) reports the site at Okaihau mentioned in the Remarks was disturbed.

DISTRIBUTION

Just N of Te Kao, D.J.R. 2/1/76, MNZ M88279. Mount Camel, N03/258088, R. Parrish & K. Walker, 6/3/88, MNZ M96551. North Mangamuka Gorge, D.J.R. 30/12/78, MNZ M61908. Waitetoki, P.M. 12/83, MNZ M101608. Mangatete Reserve, P.M. 12/83, MNZ M82450. Mt. Maungamuka, R.R. Forster, 7/1/67, MNZ M88275. Mangonui, Oruru Valley, R. Wallace, 1986, MNZ M87637. Herekino Gorge, L. Fitzgerald 1/71, AK. Kaingaroa, A.E.B., AK. Okaihau, Forest Rd., B.F.H. 4/1/76, MNZ M47325. Hokianga, Opononi, W. LaRoche, 1928, AK. Utakura, Austens Block, P05/712474, P.M. 11/87, MNZ M97934. Waima State Forest: Waiotemarama, P.M. 11/86, MNZ M98262 & 11/84, MNZ M97717; Waiotemarama, O06/505298, J.F.G. 5/90, AK. Waipoua Forest: O06/623165, J.F.G. 4/89, AK; M.L. Tapply, 12/69, MNZ M88785; Waimatenui, N. Gardner, 3/68, MNZ M37695; rest area, B.F.H. 6/10/76, MNZ M55829. Kaihu Scenic Reserve, P.M. 11/86, MNZ M98214. Montgomery South Reserve, P08/4 73761, R. Parrish, 31/5/89, MNZ M115624. Bland Bay, P.M. 10/78, MNZ M82981. Horahora Estuary, Pataua, P.M. 9/84, MNZ M82464 & 9/78, MNZ M58154. Helena Bay, V. Kessner, 27/10/83, AK. Parakao, Drinnan Rd., P.M. 2/80, MNZ M63270. Whangarei, Coronation Reserve, A.W.B., Powell, 16/12/68, AK. Whangarei Heads, Mt. Manaia, B.F.H. 26/10/91, AK & 4/3/85, MNZ M76813. Glenbervie State Forest, Marua Rd., P.M. 11/86, MNZ M98282. Hen & Chickens Islands, Taranga Is., A.E.B., AK. Tangihua Range, Mt. Huarua, M.E. Fairburn, AK. 16.3 km S of Dargaville, D.J.R. 22/11/75, MNZ M88277. Waipu Gorge Scenic Reserve, Waterfall Track, Q08/356700, B.F.H. 4/3/85, MNZ 75551. Little Barrier Is., A.E.B., AK. Waiwera, A.E.B., AK. Okura Walkway, P.M. 6/87, MNZ M99368. Waitakere Ranges: Piha, Q11/427310, J.F.G. 3/82, AK. & 1981, MNZ M70828; Huia, Q11/498698, J.F.G. 11/11/90, AK. Hunua Ranges, Moumoukai Hill Rd. - Waharau Track, S11/623013, J.F.G. 2/11/86, AK. Waiuku, W.H.W. AK. & W.H.W. ex A.C. O'Connor collection, MNZ M88273. Manukau Peninsula, Harveys Bush, F.M.C. 1 5/2/81, MNZ M82312.

ETYMOLOGY

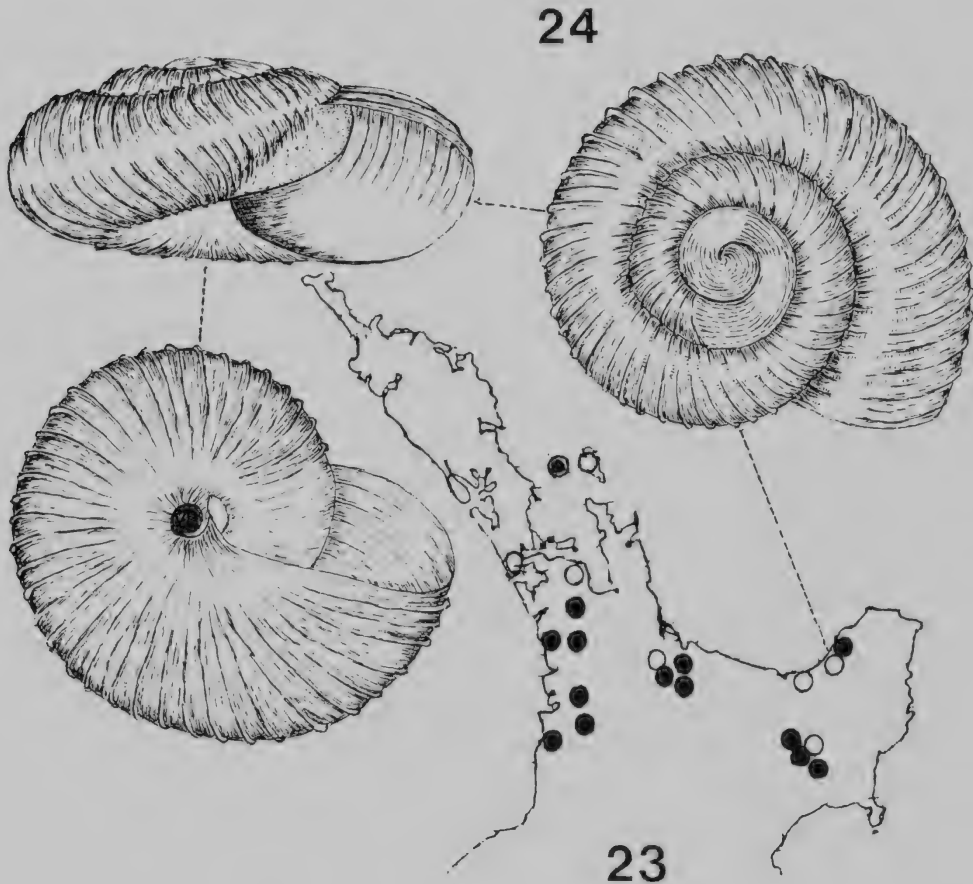
We have named this species after the late Norman Douglas, from Waiuku, who sometimes collected small land snails.

Phrixgnathus brunneus n. sp. Figs. 15, 23-24

Synonymy: '*Paralaoma*' n.sp.40 Solem, Climo & Roscoe, 1981: 479; '*Phrixgnathus*' n.sp.40 Ballance 1982: 31. Punctid n.sp.40 Goulstone 1983: 45, 1990: 41.

DESCRIPTION

Shell small, flat, spire only slightly raised. Protoconch 1.25 whorls, faintly concentrically striate. Shell 3.25 whorls quickly accelerating. Post-embryonic whorls with close, irregular, sharp radial periostracal processes sweeping backwards and proceeding half way over the base before reducing to little more than ridges near the umbilicus. Between these processes there are a few fine radials crossed by stronger concentric striae though somewhat fainter on the base. The umbilicus is quite narrow but open, not much affected by the columella which is oblique, thin and hardly reflexed. Colour dark brown when fresh.



Figs. 23-24. *Phrixgnathus brunneus*. 23. Geographic distribution. Solid dots are records from the Museum of New Zealand; open dots are records from the Auckland Museum. 24. Motu River, 2.5 mm x 1.3 mm (holotype AK 71562).

REMARKS

The 80 specimens collected by A.E. Brookes c. 1930 at the Motu River are lighter brown in the centre than others we have examined and golden at the perimeter, but this could be due to the age of the collection. This snail looks like a Flammulinid but it has affinities with both a Lord Howe Island Punctid and two sub-antarctic islands species and is better left in *Phrixgnathus* until its true position is evaluated.

TYPE LOCALITY: Motu River, Bay of Plenty. The Museum of New Zealand has specimens collected by Brookes labelled Motu River Bridge, Opotiki-Cape Runaway Highway.

HOLOTYPE: Auckland Museum, AK 71562 (width 2.5 mm, height 1.3 mm), Motu River, A.E. Brookes.

PARATYPES: AK 71563 (70 specimens) Motu River, A.E. Brookes. MNZ M115630 (10 specimens) Motu River, A.E. Brookes.

HABITAT

Under bark on fallen rotting logs. At Clevedon, South Auckland, it occurs in modified bush.

DISTRIBUTION

Great Barrier Island, Mt. Hirakimata, S08/276543, J.F.G. 23/3/90, AK. Little Barrier Island, A.E.B., AK. Titirangi: A.E.B., AK; Kauri Knoll, R11/517722, Mrs. D. Hole, 17/5/71, AK. Clevedon, Duders Bush, S11/943738, J.F.G. 11/3/90, AK. Hunua Ranges, Mangatawhiri, J.F.G. 1975, NMZ M51741 & 3/10/67, MNZ M37553. Waikaretu, Mannering Farm, G. Mannering, 1972 MNZ M47187. Ngaruawahia, Hakarimata Reserve, C. Broomfield, 7/77, MNZ M57482, M57904 & B.F.H. 30/1/78, MNZ M72388. Wairere Range, Matamata, A.E. B., AK. Upper Kaimai, A.E.B., AK. Kaimai summit, T15/687667, D.J.R. 15/4/78, MNZ M104610. Ngutunui, Walter Scott Reserve, P.M. 1977, MNZ M57540. Moeatoa State Forest, Moeatoa Track, P.M. 4/91, MNZ M70270. Waitomo: intersection S end of Mahoe Rd., B.F.H. 4/1/77, MNZ M55188; cave entrance, F.M.C. 18/2/81, MNZ M77584. Mamaku Plateau, Pukerimu Reserve, P.M. 4/78, MNZ M98288. Mamaku, W18/644694 D.J.R. 31/12/72, MNZ M48011. Summit of Mt. Ngongotaha, C. Broomfield, 12/77, MNZ M69094 & B.F.H. 2/1/77, MNZ M69795. Opotiki, A.E.B. 2/7/28 AK. Motu River bridge, A.E.B. 1928-31, MNZ M83504. Te Kaha, P.M. 7/86, MNZ M87643. Urewera National Park: Whanganui Inlet, Waikaremoana, W18/613680, J.F.G. 5/76, AK & 1975, MNZ M51742; Maungapohatu, P.M. 2/82, MNZ M76304; Manuoha 2000', W18/644694, L. Daniel, 4/89, MNZ M93061. North Volcanic Plateau, Leyland O'Brien Tramway, P.M. 6/87 MNZ M99335.

DISCUSSION

The Rev. W.H. Webster, an early collector of New Zealand mollusca (c. 1900-1910), was a contemporary of H. Suter. He came to New Zealand later in his life and took up an appointment at a small church in Waimauku (now Mauku) near Waiuku. His landsnail collection, comprising 124 lots now in the Auckland Museum, was built up by his sharp-eyed

son Francis. Waiuku, on the Manukau lowlands is a closely settled farming area today and most of the bush in which the snails were collected is gone. The Waipipi Scenic Reserve, several kilometres north of the township, is the best remaining bush close to Waiuku and samplings in recent years have found both *T. francesci* (Webster, 1904) and *T. elaiodes* (Webster, 1904) though they are scarce.

A.E. Brookes about 1930 put aside prospective types of *P. douglasi* which he intended dividing into three species, "Aeschrodomus chrysomorphus" from Little Barrier Is.; "Aeschrodomus pagodaela" from Kaingaroa, Northland and "Aeschrodomus fairburni" from the Tangihua Range. From the more extensive material which is now available this division of *P. douglasi* into three species seems feasible, but in this paper we have preferred to take a conservative view and treat it as one. Also, it is not a Charopid species but has obvious affinities with what was known prior to 1979 as *Phrixgnathus regularis* (Pfeiffer, 1855). (Climo 1979 explains the status of *P. regularis* now). This is a widespread snail further south, which does not overlap the range of *P. douglasi*.

For *P. brunneus* there were tubes labelled "Holotype" and "Paratypes" in the Auckland Museum collection with the labels "Flammulina brunneum or Flammulina innotatum". A.E. Brookes actively collected snails from the 1920s to the 1950s over most of New Zealand and N. Gardner believes that he worked as a builder on the construction of the Motu River bridge. The Auckland Museum has 600-700 lots which Brookes presented and he was a president of the Auckland Museum Conchology Section Shell Club for some years. The club owns the "Brookes Collection", a display series containing many snails arranged for easy viewing. The Museum of New Zealand also has many of his specimens. His obituary appears in the Conchology Section Bulletin No. 11, 1955.

Acknowledgements. We thank Dr Bruce Hayward for much encouragement and tidying of the text. Also Bruce Hazelwood for valuable advice and loan of maps, Hugh Grenfell for help with the electron microscope and Norman Gardner for checking the manuscript and giving us information on A.E. Brookes. Kevin Burch of Whangarei recounted some fascinating information on his great grandfather Rev. W.H. Webster.

REFERENCES

BALLANCE, A.

1982 Land snails of Little Barrier Island. *Tane* 28:29-35.

CLIMO, F.M.

1979 The systematic status of some landsnails mistakenly assigned to the New Zealand fauna. *N.Z. Journal of Zoology* 6:407-410.

1992 Some Tasman Punctid land snail margins and centres - a collage. *Cookia* 6(4):17-36.

GOULSTONE, J.F.

1983 Waitakere landsnails. *Poirieria* 13(1):1-69.

1990 Landsnails from South Auckland. *Poirieria* 16(2):2-44.

1992 Notes of interest. *Poirieria* 16(4):21.

GOULSTONE J.F., P. MAYHILL and R. PARRISH

1993 An illustrated guide to the land mollusca of the Te Pahi Ecological Region, Northland, New Zealand. *Tane* 34:1-32.

POWELL, A.W.B.

1955 Mollusca of the southern islands of New Zealand. *D.S.I.R. Cape Expedition Series* 15:125.

1979 *New Zealand Mollusca*. Collins, Auckland.

SOLEM, A., F.M. CLIMO and D.J. ROSCOE

1981 Sympatric species diversity of New Zealand land snails. *N.Z. Journal of Zoology* 8:453-485.

SUTER, H.

1913 *Manual of the New Zealand Mollusca*. Government Printer, Wellington.

WEBSTER, W.H.

1904 New Mollusca from New Zealand. *Proceedings of the Malacological Society* 6(2):106.

F.M. CLIMO, Department of Natural Environment, Museum of New Zealand, P.O. Box 467, Wellington. J.F. GOULSTONE, 89 Hall Avenue, Mangere, Auckland.